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ABSTRACT

This pamphlet, published by the Canadian Department of Manpower and Immigration, is the first of a Careers-Canada series and describes careers in construction. The pamphlet is divided into six major sections: (1) history and importance; (2) nature of the work, including planning, contracting, site preparation, roofing, finishing, plumbing; (3) workers in the industry, including design and technical staff, architects, civil engineers, and land surveyors; (4) on-site construction workers; (5) preparation and training; and (6) seeking employment. Several photographs are included. (RWP)

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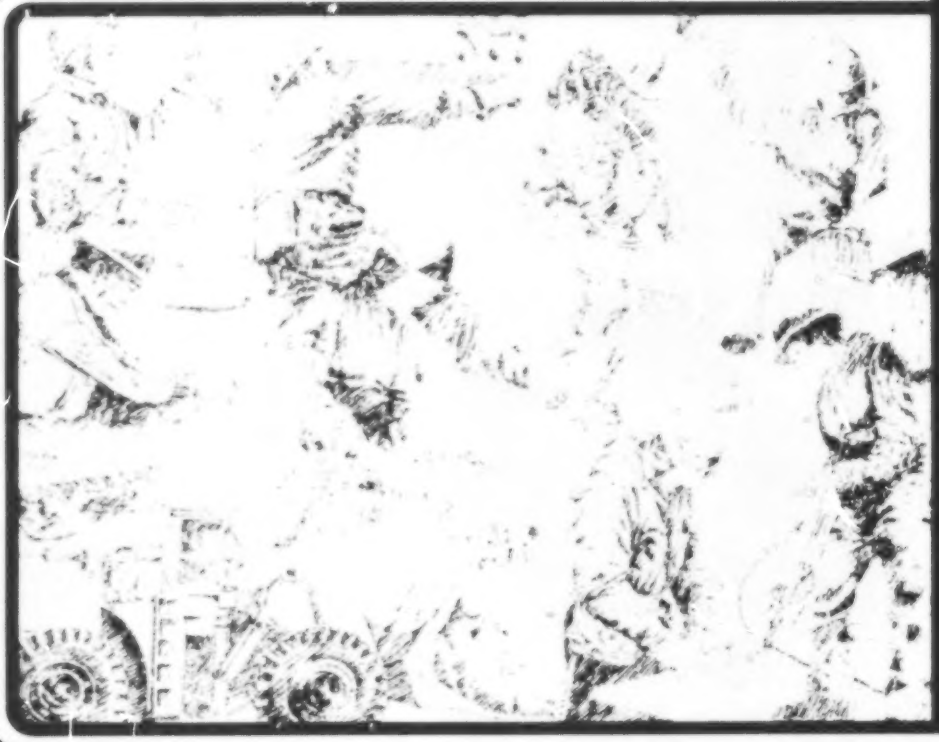
1 - CAREERS IN CONSTRUCTION

CAREERS CANADA



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MESSAGE FROM THE MINISTER

All Canadians must be given the opportunity to determine their abilities, develop them through education and training, and apply their talents in a meaningful occupation. To achieve this goal, sound information must be made available to every Canadian at a stage in their development where fruitful decisions can be made. Careers – Canada is a major effort towards this end.

The benefits of the Careers – Canada series should affect many people: the student considering entrance into the world of work; the worker seeking to change occupations; the prospective immigrant; the manpower or vocational guidance counsellor, in fact, anyone wishing to match people with jobs.

Many people have been involved in the production of Careers – Canada, I join them in wishing you every success in your career search.

Robert Andras

NOTE TO READERS

The ultimate judge of any material is the user. It is recognized that improvements can be made in the initial booklets and we ask all readers to forward any suggestions to us. The consolidation of these comments will allow us to better provide you with the type of information required.

Suggestions and comments should be addressed to:

Director,
Occupational and Career Analysis
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305 Rideau Street,
OTTAWA, Ontario.
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HISTORY AND IMPORTANCE

What is the Construction Industry?

If you stop and think about it, how many construction projects could you list in your neighbourhood alone? A new home is taking shape in the vacant lot at the corner. The roadway which takes you from your home to the nearest shopping centre is being widened to accommodate increasing traffic. A huge grey high-rise apartment building is breaking the skyline across the street from your school. And chances are that either the gas company or the city works department is putting in new piping somewhere within blocks of your home.

These jobs and more – dams, bridges, highways – are what the construction industry is all about, meeting the needs of people – to be warm and comfortable, to get from one spot to another, to have a place to work.

The industry has come a long way in Canada since early settlers built their log cabins along the St. Lawrence and the first roads were cut through timber and rock. The earliest homes were of wood, but with the need for more permanent buildings, stone quarries, brick and tile plants, and lime kilns opened up around Trois-Rivières, and stonemasons, bricklayers, and other craftsmen became active. Sheet-metal workers were busy on the silver-toned roofs so typical of old Quebec. As the country grew, docks and harbours were built to land settlers, and new roads, canals, and bridges took them over land and water westward.

As Canada's population grew, so did the construction industry, and as it grew, it changed. New methods of operation came into being, and the workers themselves became more specialized to carry out the more involved jobs.

Today more than 692,000 people are employed in firms involved only in construction. Others are with government agencies, public utility companies (hydro, telephone, for example), or manufacturing establishments, and work either on construction projects or in the maintenance of building. Many construction workers have no permanent place of employment. When one job is finished, they move on to the next, sometimes even from province to province.

The work done by the construction industry is varied and involves not only new construction projects but also large numbers of repair, maintenance, and renovation jobs. And the firms that do these jobs are just as varied. To help you understand the variety of employment available under the heading "Construction," construction work has been split into two divisions – building construction and engineering construction. Some firms, usually called "heavy construction companies," are involved in both engineering and building.

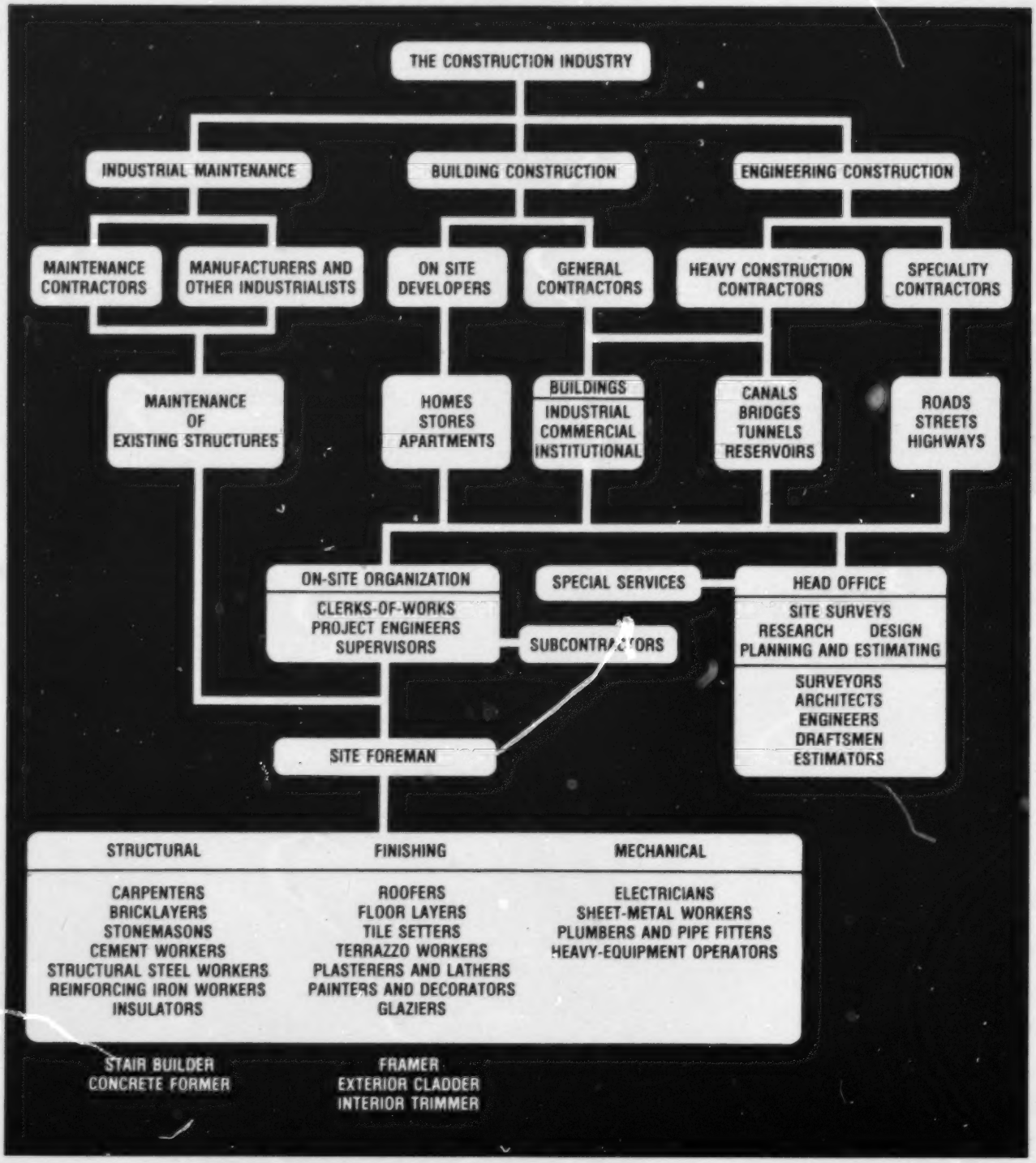
Engineering construction firms usually undertake large-scale projects – roadways, railroads, airports, bridges, tunnels, and subways; pipelines, power, and communications systems; marine works such as docks, harbours, and piers; and reservoirs, canals, dams, sanitary systems, and other waterworks. The operations of these firms can cover large distances, and in most cases, workers are hired locally. Such companies maintain their own work force of supervisory, technical, and skilled personnel who are required to travel and live considerable distances from their homes. Since most of these projects are large, workers can expect a number of years of employment before moving to another major construction job.

Building Construction can be separated into three main fields of work. General contractors construct, maintain and repair larger buildings, such as office complexes, schools, hospitals, and shopping centres. Some on-site developers build housing projects, stores, and small apartment houses to sell once the work has begun or been completed. Both contractors and developers have their own work crews and a staff of estimators, site superintendents, and other key workers.

Subcontractors provide labour and services to general contractors in any one of a large number of specialties from *carpenters* to *plumbers* to *glaziers* to *floor layers;* these are covered on pages 11 to 24.

Added to this list of possible employers are industrial companies and government agencies who hire *bricklayers, painters,* and *carpenters,* in addition to *architects, engineers,* and other technical staff. City works departments need people to construct and maintain streets, water supplies, and public utilities, as do railway companies who build and service their own rights-of-way. These workers, in contrast with those employed by construction companies, have a more permanent workplace and position.

HISTORY AND IMPORTANCE



Initiation of Work

What do construction workers do?

How does it begin?

Work on a construction project may begin in a number of ways. Many projects are begun by either a buyer or an owner of land. In the construction of housing projects and the like, a general contractor may act as developer and both gets the project rolling and completes the work. In the case of roadways and bridges, the developer may be a municipal or provincial authority. A public utility company may require a new generating station, or an industrial company a new factory. On-site developers buy land for the construction of a shopping centre or apartment building.

Planning

The planning of a construction project begins with a "feasibility study," often under the direction of an architect or *civil engineer* or both. This study establishes the suitability of the site, whether the project can be done, and how to do it.

Information is also obtained from other specialists. A proposed new highway may call for a geological study of the area. If a tunnel is to be built or land excavated, boring crews drill and provide samples of the soil structure to soil engineers. Their findings will determine whether the route is suitable and the kind of foundation required for bridges and overpasses.

A new power station, reservoir or dam requires a study of several alternative sites. Natural features may be chartered by *land surveyors*, who must also consider land elevations and legal land boundaries. The type of structure to be built – whether the bridge is cantilever, suspension, or supported on piers – and the materials to be used will involve other personnel such as mechanical and hydraulic engineers.

If the results of a study prove satisfactory, preliminary drawings and cost estimates of the structure are made for the owner and checked against governmental building regulations. Depending on the kind of structure, these drawings may be prepared under the direction of an architect or an engineer, or they may work together – the architect taking responsibility for general design and appearance and the engineer being concerned with structural features. The services of mining, hydraulic, and sanitary engineers plus the designers of electrical, air-conditioning, and similar installations may also be required on a consulting basis.

When the owner approves the preliminary plans, design plans and the detailed drawings and specifications to be used on the project site are prepared. All this information then goes to general contractors who submit "tenders" (how and at what price they can do the job) for the construction.

NATURE OF WORK

Contracting

Before a tender for a project can be submitted, a general contractor has estimators or quantity surveyors figure out amounts and costs of materials, labour, and services. The contractor may also ask subcontractors to give prices for their specialty. A steel-fabricating company, for example, may tender for the construction and erection of steelwork, or an electrical subcontractor may submit costs for lighting and electrical power installations.

On-site Construction

The contractor who is chosen to do the job starts work with a project superintendent, a general foreman who is the link between the superintendent, sub-contractors, key personnel who survey and lay out at the actual site, and other skilled workers. Larger construction sites usually require a resident engineer to check how the work is going for the civil engineer, or a clerk-of-works who does the same thing for the architect.

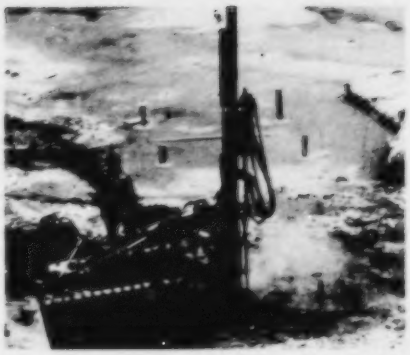
Site Preparation

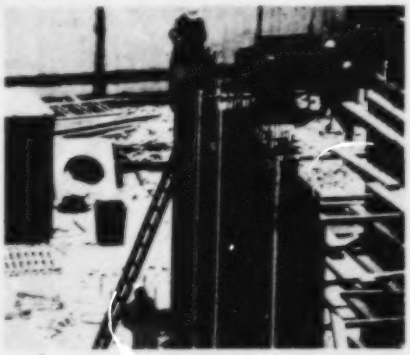
Temporary roads and water and power supplies, plus accommodation for workers and materials, may first be required. Trees, undergrowth, and rocks are cleared by slashers, burners, and bulldozer operators, and, where necessary, existing buildings are demolished by wreckers either by hand, or by demolition charges. Elevations and levelling points are determined by engineers or other technical staff, and the site is excavated by shovel operators and levelled by grader operators.

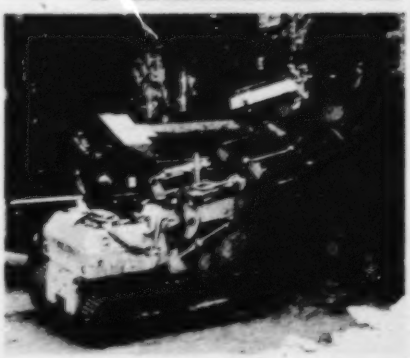
The handling of materials at the excavation site requires the use of power-driven equipment, such as draglines and scrapers, manned by skilled equipment operators and vehicle drivers.

Almost every construction site is different, requiring a variety of construction workers. In excavating, rock may have to be drilled by pneumatic drill operators and blasted by shotfirers (blasters). In tunnelling operations, miners lay and fire explosive charges. Engines for pumping water out of an excavation and providing power for other purposes are kept in running order by pump operators or stationary engineers. In marine and subway operations, caisson workers operate in chambers pressurized with air from plants controlled by air-lock tenders. If underwater work is necessary, a diver may be needed to fasten lifting gear, lay stone and concrete blocks, or use pneumatic or welding tools.

Highway construction consists mainly of excavating and grading carried out by operators of earth-moving, levelling, and transport equipment. The actual paving is done by concrete workers, asphalt layers, rakers, tampers, and paving-machine operators.







Foundations

The foundations which carry the weight of the structure are laid once excavation is completed. Where the ground is soft, pilings of steel, concrete, or wood are machine-driven into the ground by a crew of pile drivers to give support to the foundation.

Concrete is used extensively for foundations and for retaining walls, floors, and support columns. Wooden forms which give the concrete the required shape and provide support while it hardens are installed by form carpenters, who also install chutes through which the concrete is poured. Metal forms are also used. Installation in this case is performed by form setters. Most concrete structures are strengthened with steel rods which are set within the forms by reinforcing iron workers.

As a rule, concrete ready for pouring is delivered to the construction site by commercial suppliers. On some projects, particularly road building, the concrete is mixed with aggregate at the site by mixing and batch plant operators, and poured into chutes leading to the forms or forced into the forms by concrete-pump operators. Vibrator operators work the concrete to remove air spaces, and *concrete finishers* level the surfaces.

Framing

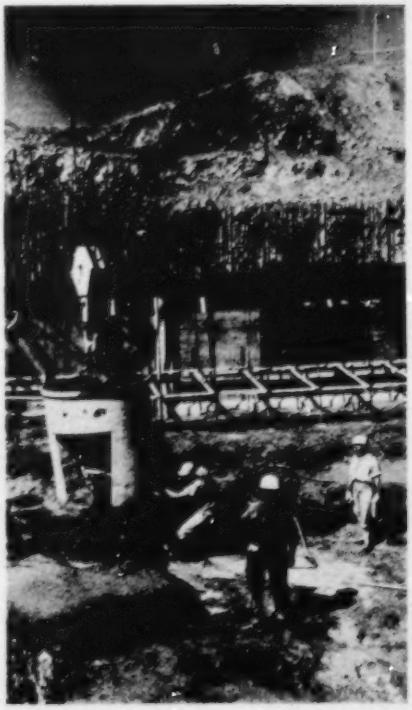
Framing and the following stages of construction are limited mainly to building projects and do not usually occur in engineering projects such as dams and canals. Construction of steel bridges and transmission towers does, however, include a stage similar to structural steel rigging, which is outlined later.

The term "framing" is generally applied to the work of frame carpenters or framers in housing and small scale construction. These carpenters lay wooden sills on the foundation, on which the floor joists rest; lay subflooring; erect the studs for siding and walls, and complete the roof frame.

Framing for large buildings calls for engineering skill and the specialized knowledge of many different workers. The materials used must be able to carry heavy loads. Structural steel, reinforced concrete, and pre-stressed concrete beams and girders are common framing materials.

In steel framing, girders, rafters, trusses, braces, and other steel supports are made according to specifications in a steel-fabricating plant and brought to the construction site where they are unloaded and hoisted into place by crane operators. *Structural steel workers* bolt them temporarily into place and align the supports. They are then permanently secured by welders or riveters.

In reinforced concrete framing, the upright columns, floor girders and beams, and roof supports are made of reinforced concrete poured into forms or moulds and allowed to harden. Floors and roof slabs may also be formed in this way. Concrete formers or formers build the plywood forms, steel reinforcing bars are bent and positioned by iron workers, and concrete is poured into forms and allowed to harden.



Exterior Finishing and Roofing

Exterior finishing protects buildings against the weather and gives an attractive appearance to the structure. The materials used in finishing will determine whether exterior cladders, carpenters, bricklayers, *stonemasons, sheet-metal workers,* or *plasterers* or a combination of these trades are used.

When the exterior walls are completed and openings for windows and doors framed, sashes of metal or wood are installed and caulkers weatherproof the joints with sealing compounds. Window sashes are frequently supplied already glazed. If not, cutting the glass and mounting it in the framework is the job of crews of *glaziers* and *metal mechanics.* Plate glass, such as is used in store fronts and doors, may be mounted in metal channels. Where the glass is not framed, as in a theatre and store doors, it must be cut to accommodate handles, hinges, and other hardware.

When roof framing is completed, *insulators* apply non-conductive materials to walls and ceilings. Carpenters then lay wood sheathing on the roof framework, and *roofers* nail on overlapping shingles of asphalt or wood or apply a hot tar and gravel coating.

Electrical Wiring

Electricians install the electrical wiring from the fuse panel to the outlet boxes before the wall studs are covered. The positioning of the fixtures, outlets and switches is determined from the blueprints of the building. The final connections are completed when the interior walls have been finished.

Plumbing

Plumbers cut, thread, and install pipes and valves and make connections with water mains and sewers. Some fixtures are installed at this stage, while others must wait until interior walls are completed.

Special Installations

Modern building requirements go beyond standard electrical and plumbing installations. Automatic heat controls, refrigeration, or air-conditioning equipment involving multiple thermostat controls, mechanical and electronic switching, and cut-out panels are installed and brought into operation by furnace installers, air-conditioning and refrigeration mechanics, *pipe fitters*, and electrical technicians.

NATURE OF WORK

Interior Finishing

Plaster has been the traditional interior wall finish, but developments in "dry wall" (composition plasterboard) and wood panelling offer new and different finishes. Wood lath, once used as a base on which to apply plaster, has given way to metal lath and plasterboard. *Lathers* nail or staple plasterboard or metal lath which forms the base for the plaster. Plasterers prepare all surfaces and then apply plaster to the walls.

Some carpenters specialize in laying floors. Wood is nailed to the subfloor boards, sanded, and protective coatings of sealer and wax are applied. Tile, terrazzo, asphalt, and concrete brick are laid by *tile setters;* and vinyl, carpeting, or similar resilient materials by floor layers.

Finish carpenters, skilled in detail work, complete stairs, moulding, cupboards, panelling, doors, and windows. These specialties may be done by stair builders or interior trimmers.

Final work to the building is done by *painters* and *decorators* who apply paints and varnishes or wallpaper. Ornamental iron workers add decorative iron supports or railings, columns, stairs, or gates where required.

Some large buildings require additional fixtures such as elevators, escalators, water tanks, sprinkler systems, or refrigerated storage rooms. These are usually installed by manufacturer's specialists.

Workers in the Industry

Occupations in the construction industry fall into two groups—(1) design and technical staff and (2) construction workers employed at the actual building site. The main reason for this division is a marked difference in methods of training and working conditions.

Teams of specialists carry out design and technical tasks under the direction of architects and civil engineers. These functions require knowledge of mathematics, science, and similar subjects normally obtained through courses in high school and later at a university, community college, CEGEP or Institute of Technology.

On-site construction work requires manual skills and is done by workers whose training is frequently a combination of work experience and trade-school education.

Design and Technical Staff

Architects

Architects may prepare design and working drawings and specifications for a variety of projects from private homes to large housing developments. They co-ordinate the work of other design consultants and supervise the construction for the owner. Architects may also be involved in town and city planning, building inspection and appraisal, teaching, and research.

The architect first consults with the client to determine the purpose of the project, its size and possible location, cost range, and other considerations. Preliminary sketches and cost estimates are made. This information is submitted to the client for approval.

The architect's staff then prepares working drawings and other data in line with building codes and local regulations. These drawings outline the details of the project and specify the quantity and quality of materials and workmanship. They are used by the contractor to estimate prices and, later, as instructions to workers on the construction site. At the same time, drawings and specifications are prepared by civil, mechanical, electrical, and other engineers working with the architect.

After tenders are received, the architect may help in the selection of a general contractor and the preparation of contracts which outline prices, methods of payment, time limits, and other special conditions.

Once the contract has been placed, the contractor assumes responsibility for all activities on the construction site. The architect ensures that design specifications are being followed, and co-ordinates the technical team. A clerk-of-works may represent the architect on the site of a large project.

The publication "Careers in Architecture" describes the duties and responsibilities of architects and discusses the preparation and training required as well as the general career outlook.

Civil Engineers

Civil engineers design and may supervise the construction of highways, dams, bridges, railroads, and sewers. Most work close to or in the larger cities, but some enjoy the wide open spaces working on dams and reservoirs. "Careers in Engineering" gives more information on the preparation, training, and career outlook for civil engineers.

WORKERS IN THE INDUSTRY

Land Surveyors

Land surveyors determine property boundaries, and may be responsible for the location, conception or planning of construction projects.

Two locations are involved in surveying. Work in the "field" may range from surveying portions of the city centre to work at an isolated site for a power dam. At headquarters, notes made in the field are analyzed and converted into plans, drawings, maps, and other data.

Field surveying is the work of a "field survey party" consisting of several persons under the direction of the surveyor. The party consists of people skilled in the use of transits, rods and chains and note keeping, and are assisted by axemen and labourers who clear brush and stake boundaries.

Certain surveying functions required on the construction site can be carried out by resident engineers or other technical staff.

"Careers in Engineering" describes the work of land surveyors, the preparation and training required, and the outlook for this occupation.

The Technical Team

A number of engineering and architectural tasks are given to the "technical team." Junior architects and engineers or specialists trained in one area of construction make up the technical team. These specialists are dealt with briefly here since they are described in the chapters "Careers in Drafting" and "Careers in Engineering." On larger building and engineering projects, several or all of the following workers may be found:

Quantity surveyors estimate costs of supplies, services, and labour and, on the basis of their work, contractors submit price quotations. In smaller companies this work may be undertaken by estimators.

Architectural draftsmen/draftswomen prepare the first drawings of the proposed structure. They also incorporate design changes and prepare the line drawings to be used on the construction site. This may be a training position for junior architects or may be done by those trained in drafting technology. "Careers in Drafting" outlines the duties and responsibilities of draftsmen/draftswomen and describes the preparation, training, and careers outlook for this occupation.

Engineering draftsmen/draftswomen make drawings of supporting framework for buildings, bridges, and similar engineering structures. They may be trainee engineers or have community college training in structural drafting techniques.

Junior draftsmen/draftswomen help prepare detailed drawings and tracings to be used on the actual construction site.

Model makers and artists make scale models of projects and illustrations to help the client visualize the suggested design and for test purposes.

Clerks-of-works may be registered architects. They are appointed to the building site by the chief architect to check the progress of the work.

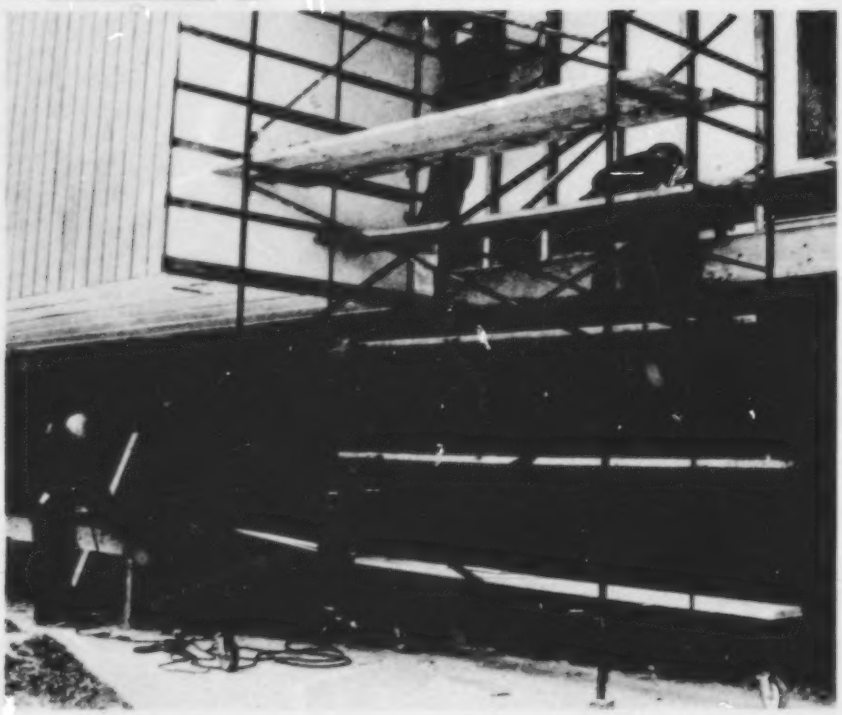
Resident engineers are employed on the construction site and serve as a link between the engineers and the contractor's superintendents.

On-site Construction Workers

Of the many on-site workers, a large number of those in engineering construction are trained "on-the-job." They are hired as helpers or labourers and are upgraded as they gain necessary skills through practical experience. On the other hand, most workers in building construction are trained through apprenticeship —a specific period of practical experience and classroom study lasting several years.

Most construction projects employ apprentices to assist the qualified workers, together with many helpers and labourers to handle materials and do routine work.

ON-SITE CONSTRUCTION WORKERS



Carpenters

Carpenters form the largest single group of building tradesmen. Their skills are needed at all stages of construction, from the installation of forms supporting the concrete foundations to the last cupboard door.

Carpenters involved in the construction of single homes may be—general carpenters with all-round skills. They may be required to estimate amounts of materials and labour, to prepare sketches in line with local and other building regulations, and to lay out, cut, and install all woodwork from the rough framing to the finishing trim.

On large construction projects, more specialization occurs. Frame carpenters or framers erect floor joists, wall studs, rafters, and similar supporting framework, and concrete formers construct and install the wooden supports for the concrete used in dams, tunnels, foundations, roof slabs, and exterior sheathing. Other carpenters—under the titles of exterior cladders, interior trimmers, and stair builders—are responsible for exterior and interior trim, doors, wall panelling, door hanging, and stair building.

In addition to carpenters employed at the construction site, many work in plants manufacturing factory-built units ranging from doors and garages to sections of houses. Here they are helped by bench hands and operators of jointers, planers, shapers, and other power-driven equipment. Carpenters also renovate, repair, and maintain existing buildings.

Other related though separate crafts in woodworking include cabinet and furniture makers who do intricate work, and patternmakers who are employed in foundries and related industries.

ON-SITE CONSTRUCTION WORKERS

All carpenters must be skilled in the use of hand and power-operated tools and be able to read drawings. They must know the working properties of composition board, plastics, asbestos, and metal, often used in place of wood, and be able to install factory-built units such as doors and windows.

Bricklayers and Stonemasons

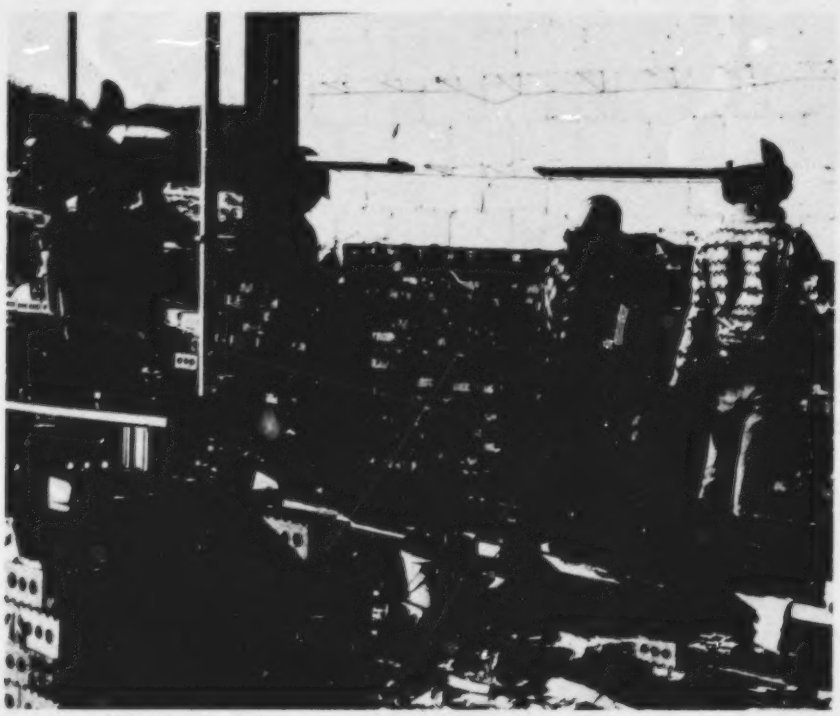
Bricklayers set out and lay bricks, structural tile, ceramic veneer, artificial stone and blocks of concrete, glass, and other structural materials for a variety of building projects. These projects range from load-carrying exterior walls, internal partitions, and similar structures above, below, or on the ground to ornamental detail such as fireplaces.

Typical of the bricklayer's work is the construction of a new home. The first step is to "set up" and indicate on the foundations where bricks or other building materials are to be laid. This is done by arranging lines of thin cord from wooden frames previously set at the corners of the building. Bonding material or mortar is trowelled onto a brick which is then placed exactly at the point where the lines cross. This is repeated at all corners, and the positions of such features as door openings are marked. "Setting up" calls for accuracy, the ability to read architectural drawings; skill in the use of plumb bobs, spirit levels, rules, and straight edges, and a knowledge of the principles of construction.

When the setting up has been completed, a team of bricklayers and apprentices lay several courses of brick in triangular form at each corner of the building. If necessary, bricks are cut with power-operated saws or, on smaller projects, with hammers, chisels, or a sharp blow of the trowel.

The bricklayers next stretch a line to act as a guide between the corners and lay straight runs of bricks. This is continued, until the wall reaches the required height. Finally, to improve the appearance, the joints are pressed with a steel roller or "pointed" (filled) using a small trowel.

The method just described is called



"straight run" and is the simplest form of bricklaying. Some methods are not so simple. The steel framing of an engineering structure may be decorated with patterns of brick calling for skill in cutting and arranging. Bricks in varying shades may be arranged in pleasing patterns; this requires artistic talent and a good eye for colour blending. Archways, decorative pillars, and other ornamental work demand additional skills from the bricklayer.

Bricklayers are employed in firms specializing in the repair, alteration, and renovation of existing buildings. This includes a full range of work, from repairing a cracked wall to adding a new room to the building. Since the bricklayer must repair the damage and discover the cause, such work requires a good knowledge of the principles of construction.

Bricklayers are also on the payroll of other organizations such as hospitals, real estate companies, municipal authorities, and manufacturing companies, where they usually do repair and maintenance work. Work such as lining furnaces in steel-making plants, building industrial chimneys, and lining mine tunnels is done by bricklayers, who have required special skills.

The work of the stonemason is similar to that of the bricklayer, and in some provinces the two trades are combined. The stonemason works with stone slabs and blocks which require considerable cutting to shape at either the masonry yard or construction site.

In the yard, sections of stone are cut into blocks with power-driven saws and may be further shaped with power-driven lathes and shapers. Patterns may be cut in the stone with hand chisels or by machine. Hoisting holes are cut, and the blocks may be polished with rotary grinders. This work requires good control of the hands and a delicate touch. Carving, lettering, and work on monuments is done by those trained as artists rather than stonemasons.

The job of the mason at the construction site begins with placing blocks of stone in position using crowbars, pulley blocks, and other hoisting tackle. The spirit level, rule, and straight edge are in constant use, and the mason must exercise considerable judgment. Although the stones are shaped in the masonry yard, they may require further dressing with chisels and heavy hammers before they fit exactly. Holes are cut to accommodate bolts and clips which hold the stones to steel framework.

Some work becomes available for masons in the restoration of historical

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structures. Decayed or damaged stone is cut away with chisels, and drawings are made of old stones. Replacement blocks are made, and then hoisted and fixed into place.

Structural Metal Workers

Much use is made of prefabricated steel parts, reinforcing iron rod, and metal mesh in commercial, industrial, and large residential buildings, in bridges and tunnels, and in radio and microwave towers.

Assembly, erection, and installation of these metal components is done by workers in distinct occupations, although some are skilled in several or all of the following phases of structural metal work.

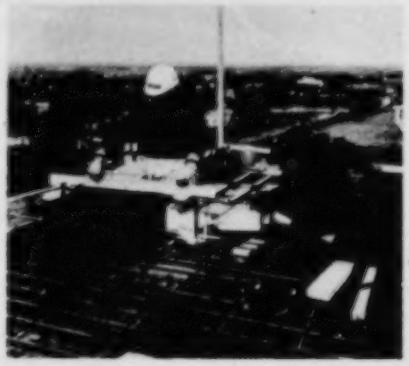
Reinforcing iron workers are chiefly employed in setting iron or steel bars to reinforce the concrete used in beams, piers, walls, floors, and roofs of a building. The workers cut, bend, and install the bars according to engineering drawings or verbal instructions and hold them in position with wire, metal clips, or by welding. Coarse metal mesh is used to reinforce roofs, floors, and in particular, the surfaces of highways. Reinforcing iron workers measure the surfaces to be covered, cut and bend the mesh, and secure it in position where the concrete is to be poured.

Structural steel workers usually work in a team that includes riggers, crane or hoisting equipment operators, and possibly riveters or welders.

From drawings, they determine the correct layout and arrange the steel parts of the building framework for erection. Equipment operators, riggers and helpers erect hoisting equipment and metal scaffolding, sometimes directed or assisted by structural steel workers.

Girders, beams, or sections are made in metal-fabricating plants, and on site, are hoisted into position. Welding or riveting crews complete the final assembly.

Ornamental iron workers install grilles, iron ladders, catwalks, fire escapes, stairways, and similar fixtures and also do decorative metal work for fences, balcony railings, and gates. They must be skilled in the use of iron, aluminum, brass, and bronze. Ornamental or decorative metal work is usually done in metal working shops but may require cutting and assembly on the construction site before installation. The ornamental iron worker assembles, bolts, or welds the parts into complete units and sets them in position with concrete.



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Roofers

Roofers apply shingles of composition, asphalt, or asbestos to the roofs of buildings or coat them with tar, asphalt or other weatherproofing materials. Their work also includes waterproofing and weatherproofing walls, and other building surfaces.

The roofer's job is best explained by an example. In composition roofing, the worker first covers the surface with overlapping strips of asphalt or tarred paper. Where surfaces join, metal or asphalt strips known as "flashing" are nailed to make the joints waterproof. Shingles are then placed in overlapping rows and are nailed in position. Finally, exposed nailheads are weatherproofed with roofing cement.

Roofers may also use layers of roofing paper and hot tar, or they may use asphalt which is brushed on and finished with small pebbles as a weatherproofing measure. Throughout this work, the roofer uses hand tools such as the roofing hammer, knives, pincers, and caulking gun.

Metal roofs are the work of sheet-metal workers. They solder together or overlap sheets of metal such as tin, copper, or galvanized iron, and nail them to the wooden sheathing of the building.

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Electricians

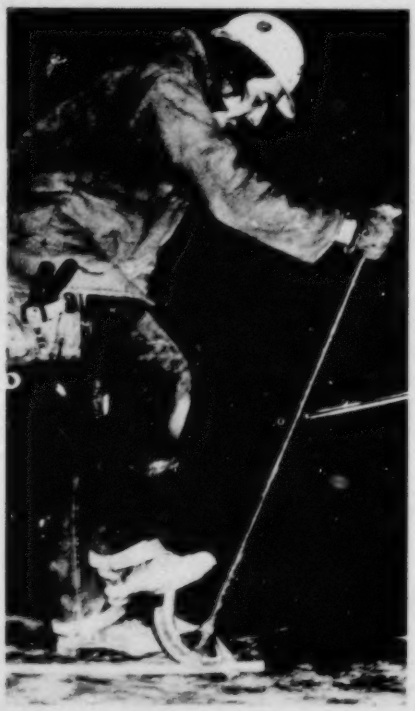
In the construction industry, electricians install electrical systems in buildings and engineering projects, or extend and repair existing installations. Electricians also work in several other areas than construction. Industrial electricians, for instance, service and repair electrically operated machinery and equipment used in industry.

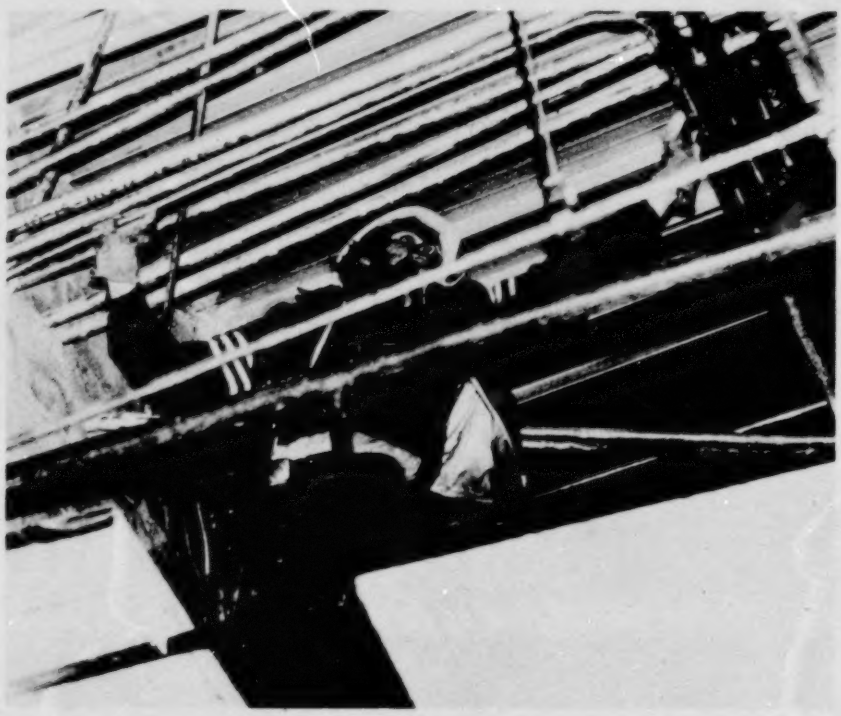
The basic work of electricians includes the layout, installation, maintenance, and testing of electrical circuits, fixtures apparatus, and control equipment used in lighting, heating, and air-conditioning systems. They use and maintain hand and power tools, portable equipment, and testing and measuring instruments. A thorough knowledge of the Canadian Electrical Code is required since it must be followed in certain regions and types of work. In addition, they must know and comply with local, provincial, or municipal regulations.

Duties of the construction electrician depend on the type of building project but are usually in four main steps. First someone has to work out how the job is to be done. This is known as "layout." Then wiring, cables, and conduits are run between the supply points and the points where the current is to be used. Next, concealed equipment such as switch boxes are installed before the walls are plastered and the floors laid. At a later stage, various fittings such as service panels and lights are installed. Finally, everything must be tested to ensure that it is correctly connected and safely insulated.

Responsibility varies with the extent of the project. On larger projects, installations are made according to drawings prepared by electrical draftsmen/draftswomen. On smaller jobs, the electrician is responsible for all work including planning and layout.

Electricians require a keen sense of responsibility and a methodical approach. They must be able to write an account of the work and to understand drawings.





Plumbers and Pipe Fitters

In the construction industry, plumbers install piping systems and fixtures that provide water or dispose of wastes. In addition to new construction work, plumbers repair, maintain, or remodel systems in existing buildings.

Although both plumbing and pipefitting are part of the plumber's craft, particularly in the smaller centres, some workers specialize in either plumbing or pipefitting. Steam fitters install and service piping used to carry steam in commercial and industrial buildings. Gas fitters install, repair, and maintain gas burning equipment and associated piping. Gas appliance installers and repairers are described in the publication "Mechanical Repair Occupations." Pipefitters are employed on the complex piping used in oil refineries and petro-chemical plants, and also work in shipbuilding yards, pulp and paper mills, and food processing plants. Sprinkler fitters install pipes to conduct liquids and gases used in fire protection.

The work done to equip a new home typifies the construction plumber's job. The plumbing contractor examines the architectural drawings and arranges to use both standard-sized and non-standard piping and sections. The contractor also provides sketches and other instructions to the plumbers who are to do the job.

On the site, plumbers measure and mark the location of faucets, sinks, and holes through which pipes will pass. Then before the walls and floor are finished, they "rough in" all piping which will later be covered. From the basement, vertical pipes are installed up through the floor into the kitchen and bathroom. The pipes may have to be cut and connections made to join the sections. From couplings in the vertical pipes, other sections of pipe are laid between the floor joints and wall studding, and outlets are left for fixtures. Piping is then laid for drainage and the disposal of waste.

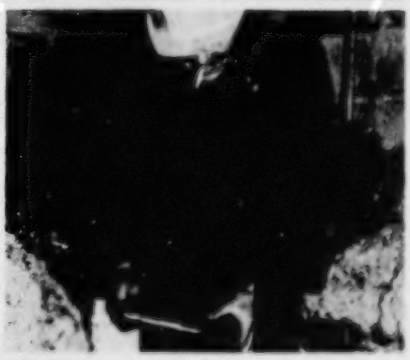
Work does not end with the laying of pipe. The plumber will install traps to prevent sewage gases from entering a building, catch basins to trap kitchen wastes, drain tiles to prevent water from seeping into the building, and lastly, venting pipes.

Carpenters and plasterers finish the rooms, and the plumber then installs sinks, toilets, faucets, and perhaps radiators. Finally the system is tested for leaks. Since all plumbing work must meet with municipal regulations, testing is done under the supervision of a public health representative.

In repair work, the plumber fixes defects in existing systems. This may consist of removing defective pipes, opening clogged drains, or replacing worn washers.

Pipefitting is similar to plumbing in that the work is done according to drawings. Pipes are cut, bent, and threaded, and the assembled sections are installed. Because steam and refrigeration pipes are under pressure, methods of making pipe joints differ from those used in plumbing. Some are bolted together, while other joints are sealed or welded.

Plumbers and pipefitters must possess a variety of skills. On the construction site they use hacksaws, reamers, and pipe cutters as well as hand-held hydraulic benders to make parts. Pipe and section joints are bolted, welded, soldered, or brazed. Thus, knowledge of the use of wrenches, welding equipment, and blowtorches is required. In addition plumbers must be able to measure accurately and read architectural



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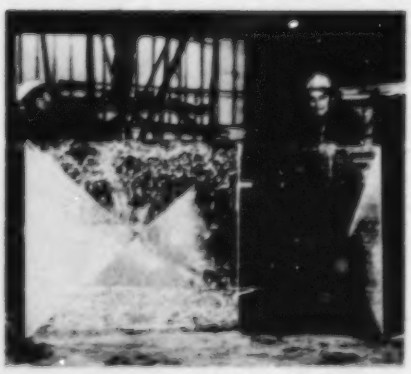
drawings.

Some tools are supplied by the employer, but most workers purchase their own hand tools during their apprenticeship.



Sheet-metal Workers

Sheet-metal workers on the construction site install ducts and other parts used in ventilating, and air-conditioning systems. They also install metal roofing, wall sidings, drainage gutters, partitions, and other metal framework required in homes, business, and industry.

Ducting is often ready-made when it is delivered to the construction site. However, it and other metal units often have to be made or adjusted to fit available space and structural conditions on the site. In the sheet-metal shop, the worker determines the size, thickness, and kind of material, such as galvanized sheet, to be used. The metal is cut with power shears, shaped on presses, bending brakes, and other power-operated machinery, and holes are cut and drilled. It is then welded, and joined into finished sections.

On the construction site, the sheet-metal worker operates out of a portable workshop where the ready-made sections are cut to suit the installation. The sections of ducting are then fitted together and are put on brackets and hangers on the building. The joints are bolted, welded or soldered, and covered with leak-proof materials.

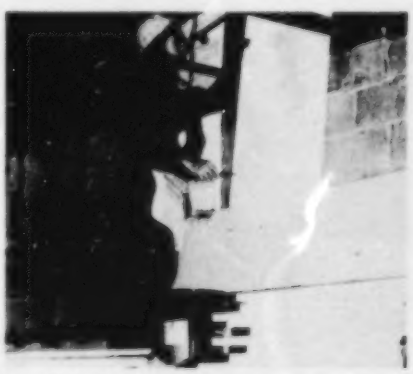
In some cases a worker will both make the material and be responsible for its installation. However, the worker may specialize and become a sheet-metal installer.

Many sheet-metal workers are employed in industries which make automobiles, agricultural implements, boats, and aircraft. These workers are described in the publication "Mechanical Repair Occupations."

Insulators

The principal work of insulators is to apply non-conducting materials to ceilings, walls, and floors, and also to piping, boilers, and other heating equipment. The materials used include cork, felt, asbestos, and fiber glass, and they serve the purpose of preventing or reducing the passage of heat, cold, or sound. On the job, insulators examine the plans and specifications and decide on the most suitable material. Rock wool, spun glass and other material is then cut to the required size and shape, and fastened to the building framework. Other insulating substances including blocks and slabs of foamed plastic or cork are secured in place with an adhesive. Insulators may also spray or blow foam or other substances between walls, floors, and ceilings.

Insulators use various methods to cover pipes, ducts, boilers, and similar equipment. Block and preformed insulation may be wrapped around pipes ensuring that joints and other connections are completely covered. Insulating materials are secured to surfaces with wire bands or sheet metal and strapping. Joints may be coated with an asbestos cement and then wrapped with tape to provide a tight seal. On some jobs, the workers spray or plaster the material to a wire netting placed over the surface to be insulated.



Glaziers

People who cut, fit, and install plate mirrors and such items as leaded glass panels are glaziers (glass workers). In making a simple window-glass installation, the glazier cuts the glass to size or selects a precut panel of glass. A bed of putty is then put into the sash and the glass pressed into place. It is later secured by wire clips or metal points and finished by smoothing putty around the outside edges.

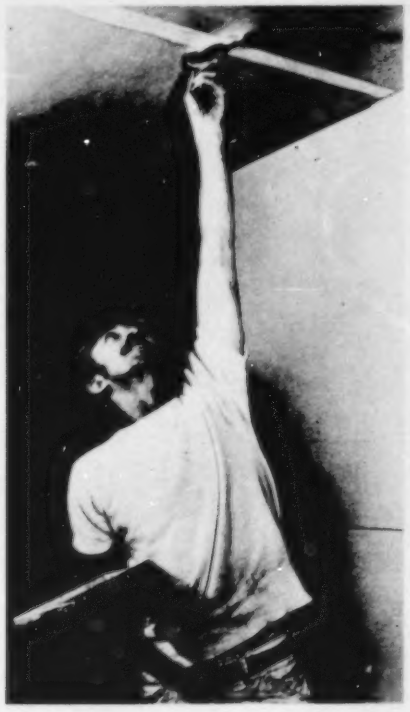
These workers are sometimes referred to as glaziers and metal mechanics. Since the increasing use of glass in building construction has enlarged the traditional scope of the work, glaziers generally install all types of interior and exterior structural glass. During installation they apply cement to the supporting backing, and press the glass into it, or else set the glass by use of metal retaining mouldings. They also set a wide variety of automatic doors and other ready-made glass units that are used in buildings.

Plasterers and Related Occupations

The covering of walls and other surfaces with plaster and similar materials may be the work of plasterers or, as is usual on larger projects, be divided among several trades. These include plasterers, lathers and drywall installers, tapers and sanders.

Plasterers apply wet coats of materials to the interior and exterior of buildings, to provide plain and ornamental surfaces which are fire resistant and can later be painted or decorated.

In the first stage of interior plastering, the lather prepares the walls and ceiling. Brickwork and concrete are left rough, but smooth surfaces, joists, and studding are covered with gypsum lathing or metal mesh to provide support for the plaster. Finally, two or three successive coats of plaster are mixed by helpers, and applied to the walls.



After the lathing has been put in position, the plasterer loads up a "hawk"—a small board with a handle—and applies small dabs or "dots" of plaster with a trowel to the top and bottom of the walls. The dots are measured until they are perfectly upright and represent the final thickness of the plaster to be applied. Between these dots, strips of plaster or "screeds" are laid with a trowel and smoothed with a long, straight board or "darby." The final coat is a thin mixture of lime, plaster, and water which may be smoothed or textured in decorative patterns.

The introduction of new plastering techniques has created other methods; for instance, lathing and several coats of plaster have been eliminated by the use of "drywall" or plaster board (a sandwich of plaster between sheets of paper). This work is performed by people known variously as drywall installers, tapers, and sanders. They nail sections of board to wooden joists in the walls and ceiling, and then cover the joints with fabric tape and plaster and sand them smooth.

For most walls and ceilings, plain plastering is all that is required. However, plasterers may make and install ornamental panels such as cornices. To make a decorative shape, the plasterer cuts thin sheets of metal which are mounted on wooden frames. On the walls and ceiling, the main location points for the various sections are marked and pieces of wood are nailed to act as guidelines. Plaster is then applied and pressed into shape with moulds.

Often cornices or other shapes are ready-made in the plastering shop. The precast shapes are nailed, screwed, or plastered to a wooden framework in the walls. To complete the work, plaster is added and smoothed until the shapes blend in with the contours of the walls.

Decorative panels and ornamental mouldings are also made in the plastering shop, and this small branch of the craft may appeal to those with artistic talents. Plain and geometrical shapes are made in sections using "horsing" moulds or cast in sections in jelly moulds, and designs, such as scrolls, are then added to the plainer sections. Complex decorations may be modelled first in clay by specialist modellers. From this, the plasterer makes jelly moulds and castings.

The exterior of buildings may be covered with stucco either by plasterers or specialists known as stucco masons or stucco plasterers. Their work is similar to that done inside the buildings except that more cement is used for weatherproofing. Wire mesh normally provides the base on which several coats of plastering materials are applied. The walls are then smoothed or decorated with the mason's own design or with small stones. The stucco mason may also have to make cornices, and mould ledges, and other ornamental shapes.

Tile Setters and Terrazzo Workers

Exterior and interior walls of buildings, floors, and other surfaces may be covered with ceramic tiles and similar materials which are applied by a tile setter.

Floors may also be covered with marble chips set in cement by a specialist known as a *terrazzo worker*. Workers in closely related occupations include marble setters who attach panels of marble to walls or other surfaces, and cement finishers who lay plain, ornamental, or speciality floors of cement.

In any tiling job, existing surfaces must be checked with a spirit level, straight-edge, and rule, and any defects repaired with plaster and cement. If both walls and floor are to be tiled, the tile setter starts on the walls by marking out a line known as the "datum line" from which all measurements will be taken. From the datum line, the position of the bottom row of tiles is marked on the wall and any special arrangements laid out.

Clay tiles are soaked in water, drained, and covered with adhesive. Starting with the bottom row, the tiles are pressed into position on the walls. Some tiles are cut to fit corners or around pipes and this is done with chisels, hammers, and pincers. Joints between the tiles are filled with cement and the surfaces are cleaned.

The walls of buildings may be covered with marble panels, structural glass, or panels of terrazzo. This is similar to tiling except that the panels are of larger size and few changes are made since polishing and cutting are completed before delivery to the construction site. The panels are attached with plaster and cement mixtures or secured with bolts.

In floor tiling, a strip of wood is fixed to the subfloor to mark the edge of

the first row of tiles and to indicate the height of the finished floor. The tiles are then pressed onto a mortar bed or adhesive is spread over the floor.

Using similar techniques, floors are laid in a mosaic which consists of very small tiles supplied in pre-arranged patterns and mounted on fabric mesh or stiff sheets of paper. Tiles or terrazzo may also be supplied on a backing in pre-arranged patterns ready for laying.

In laying terrazzo, the subfloor is often covered with floor paper; metal strips indicate joints or a change of colour, and moulds indicate lettering or decorative patterns. Next a dry layer of concrete is spread over the paper and is smoothed with a straight edge and trowel. The terrazzo worker then applies a mixture of sand, cement and marble particles following the pre-arranged colour patterns and designs. Before this mixture hardens, marble chippings are scattered over the surface. Later, the surface is ground and polished by machine.

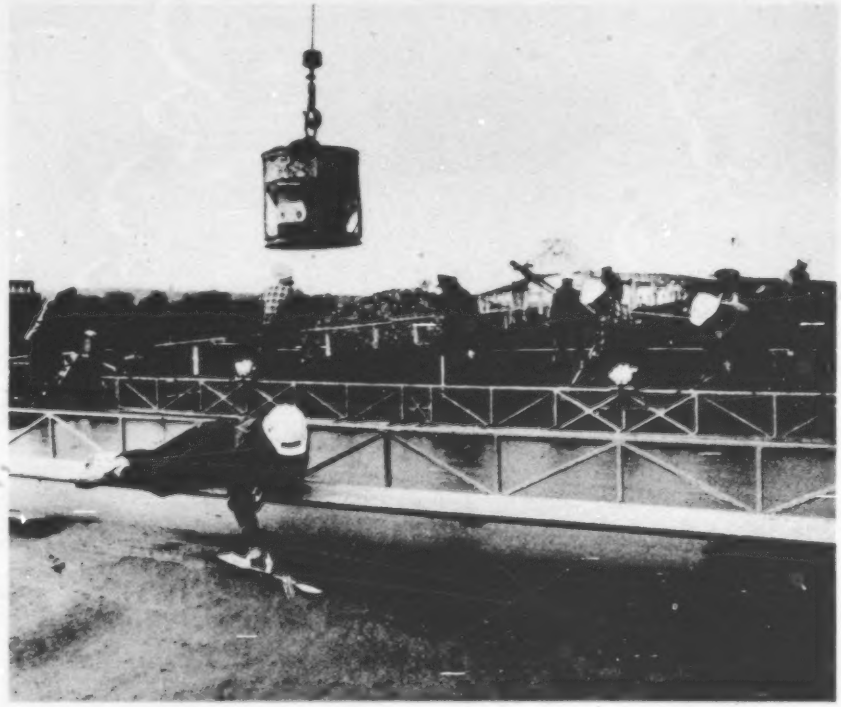
The workers are assisted by apprentices and helpers who keep them supplied with materials, erect scaffolding, clean the tiled surfaces, or operate polishing machines.

Concrete and Cement Finishers

Extensive use is made of concrete—a mixture of cement, sand, and broken stone or "aggregate"—for construction purposes. The job of the *concrete finisher* is to smooth and weatherproof exposed concrete surfaces of floors, curbs, sidewalks, and highways. Cement finishers may cover or "finish" the concrete surfaces with cement to repair defects or to produce special shapes. These workers are also known as cement-and-concrete masons or finishers. Others specialize, particularly in highway projects, and are known as: curb builders, joint setters, concrete pointers, and float finishers. In all but the smallest projects, concrete is now laid by machines and the surfaces finished by tamping-machine operators or vibrator operators.

Cement finishers fill depressions and smooth surfaces with a board or straight-edge that extends across the poured concrete. They use such hand tools as trowels and wooden floats to grade slopes, or to make special shapes around drains and manholes.

An example of work done by hand is the building of a driveway. First, a frame is made from straight lengths of wood. Concrete is poured in the frame, and levelled by the concrete finisher who pulls a long piece of wood or "screed" over the surface. Before the concrete is dry, the finisher works the surface with trowels and other hand tools. Some concrete surfaces are left rough and the finisher applies coatings of cement, hot asphalt, or other weather-resistant materials. The coatings are then smoothed or patterned to provide nonslip surfaces.



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Floor Layers

The increasing use of carpeting and other floor coverings has created a demand for skilled floor layers. These workers apply decorative and protective coverings including carpeting, linoleum, vinyl, and asphalt tiles, to floors in industrial, commercial, and residential buildings.

Regardless of the material used much of the work is the same. The surface is carefully measured and planned to minimize waste, before it is cleaned, dried, and checked for irregularities. The floor covering is then cut, matched, and fitted with special attention to door openings and fixtures such as pipes.

The carpet layer may fasten a strip with adhesive or nails along the border of the installation. The carpet material is then secured to this strip. With some types of floor covering, it may be necessary to resurface the area. Next a suitable adhesive is applied, the covering material is laid, and is then rolled to cover seams and to ensure good adhesion. Tools used by floor layers include shears, staple guns, sewing equipment, scribers, and squares.

Painters and Decorators

The job of the painter and decorator is to apply paint, other liquid coatings, and paper or fabric to the interior or exterior surfaces of buildings and other structures. Before work begins, the painter may have to estimate the materials, time, and costs, and supply this estimate to the customer. In larger businesses, this work may be done by other staff members.

In any painting and decorating job, existing surfaces must first be prepared and scaffolding may be erected. Rough areas are smoothed by sanding; nail holes, cracks and joints are filled with plaster or other materials, and rotted timbers may have to be replaced. Finally, the areas are brushed or washed clean. In maintenance work, old paint is removed either with a blowtorch or paint-stripping liquids. Wallpaper is removed by steaming.

Scaffolding is built according to the

height of the surface to be decorated. Use of this equipment is rigidly controlled by municipal and provincial safety codes, and the painter must know the types of scaffolding specified for a particular situation, and the related safety features.

After the surfaces have been primed, materials such as paint, enamel, or varnishes are applied with a brush, paint roller, or spray gun. Part of the painter's skill lies in the knowledge of the different materials and techniques to be used on various surfaces.

Skill is needed to produce attractive and suitable colour schemes, and paints may have to be specially mixed for a particular job. A painter must know their suitability, drying and handling qualities, and must be able to match or adapt colours. In addition, some painters are required to make lettering and designs either by stencil or freehand.

Painters may specialize in one technique such as spray painting or in one type of work such as painting structural steel work. Others do renovation work only. In many homes and businesses, increasing use is being made of wallpaper, wood panels, and other materials such as plastics. This provides work for the all-round painter and decorator.

In wallpapering, existing paint or paper is removed and the walls are "sized" with a preparation that prevents absorption of the wallpaper adhesive. Wallpaper is supplied in rolls that are cut to the required length. The decorator may mix and apply adhesive evenly over the back of the paper or the paper may be prepasted. The paper is folded into convenient lengths, and the decorator smoothes the paper into place with a brush. Finally the top and bottom edges are cut, and the overlapping edges are smoothed with a small roller.

Construction Labourers

On all construction projects there is a large requirement for labourers. Many workers assist in preparing the site and work with the machine operators for brush clearing, ditch digging and other manual tasks. They also carry materials to the skilled workers such as the carpenters and bricklayers. Many labourers progress by working as helpers and learn the trades over a period of time.

ON-SITE CONSTRUCTION WORKERS

Construction Machinery Operators (Heavy-equipment Operators)

A wide range of heavy power-driven equipment is used on all construction sites in such work as excavating, hoisting, and site grading. This equipment is operated and serviced by workers who are usually identified by the type of equipment they use, for example: tower-crane operator, power-shovel operator, driller, pile driver, bulldozer operator, concrete mixer, hoisting engineer, crane operator.

The main job of these people is to operate control devices. These devices range from the few needed to operate a bulldozer to the many levers and other controls used by a crane operator to raise or lower the crane boom. Each piece of equipment requires different operating techniques, and the worker should be able to operate several of the machines used on the construction site. In addition, the workers lubricate the machines, make minor repairs, and may replace certain parts. Major repairs and overhaul are, however, usually done by heavy-duty equipment mechanics or repair workers whose duties, training, and occupational outlook are described in the publication "Mechanical Repair Occupations."

Preparation and Training

While still in school it is possible to prepare for entry into the construction field through shop courses which teach manual skills. These courses offer a chance for the students to discover the type of work which appeals to them most, and whether they want to spend three or four years learning a craft.

For those who have left school, courses are available in provincial trade and vocational schools, CEGEPS, Institutes of Technology, or community colleges. These may be related to certain occupations such as carpentry, or may give a background for a number of occupations. These can be taken day or evening and run from six to ten months.

Apprenticeship Training

Most skilled workers in the building trades serve an apprenticeship. As apprentices, they learn the practical side of the job directed by a qualified worker. They must also attend a trade school to learn the theory and practice of their craft. Most apprenticeship programs run three to four years, and the applicant must be 16 years of age and have at least a Grade 9 education.

Apprentices work and are paid while they learn. They enter into a written agreement with an employer which outlines length of apprenticeship, amount of in-school training, pay scales (these vary according to occupation and location), and working conditions. A three- to six-month probationary period (on the job) is common before the agreement is actually signed. All agreements allow for the cancellation if the arrangement becomes unsatisfactory.

On completion of apprenticeship in some occupations, trade tests are given and certificates awarded to successful candidates. Some provinces demand such a certificate before a person may be allowed to work in a trade. Interprovincial standards for the examination of graduating apprentices have been established in a number of occupations, and those attaining those standards are able, in most provinces, to practise their trade without further testing.

Working Conditions

In the pages which you have read, mention has been made of working conditions. These are important when considering a future career because they play a large part in the "lifestyle" you may wish to have.

The lifestyle of persons in construction is quite different from, say, persons in retail stores. You must be willing to go wherever the building site is, work long hours and in all weathers, and you need to be healthy.

Working conditions will of course be different with different jobs and will depend on the construction specialty of your employer. In general, however, workers on construction sites do not have a permanent workplace. When the building is finished, they have to move on to the next, sometimes just across town but possibly many miles away. This means living away from home, perhaps in a trailer camp or rented rooms, for months at a time.

You will be faced with being hotter in summer and colder in winter than, say, a worker in a manufacturing plant even though employers often cover partly finished buildings with plastic sheeting and provide space heaters.

Working hours are affected not only by weather but also by "completion dates." A new school must be ready the first day after the summer holidays are over. A clover leaf crossing must be quickly completed to reduce road problems and traffic disruption. What does this mean? You will often work overtime (at one and a half or twice the usual pay) during the summer to take advantage of the longer hours, to make up perhaps for non-delivery of materials, and to meet the completion dates.

Among other considerations are physical requirements. You have seen cranes and hoists on building sites, but the workers still have to handle materials. In the average day, a bricklayer handles many hundreds of bricks, each weighing about seven pounds. The plasterer must reach overhead to cover a ceiling, and the steel erector pulls and pushes heavy pieces of metal, probably working several hundred feet above ground.

None of this means that you have to be the local weightlifting champion. The workers develop skills—a kind of rhythm—which makes such things as lifting, bending, stooping, and kneeling much easier to them than to non-construction workers.

There is also the question of pay scales. To give you an amount in dollars and cents would not mean too much. For one thing, pay rates change quickly, and there are different rates in different regions.

Your local Manpower centre has up-to-date figures if you need them. To give you some general ideas, however, here are some comparisons. These are averages; you may be earning more if you work overtime, and less if you take time off.*

Industry	Yearly $	Weekly $
Construction	12,532	241.00
Transportation	10,244	197.00
Manufacturing	9,360	182.00
All workers in Canada	8,963	172.00

What are the attractions of the construction industry? These can best be described by the industry itself:

A construction career is:

- construction pays the highest

*Employment Earnings and Hours by Industry, May 1974 (Statistics Canada).

PREPARATION AND TRAINING

wages and salaries in Canada;

• in 30 years Canada will need another building, road and bridge for every one in existence now and this means that your skills will be in increasing demand;

• construction is Canada's largest industry which means there are plenty of opportunities for you.

Advancement

Most craftsmen in the construction industry who are able to handle their fellow workers may advance to supervisory positions. Some workers undertake subcontract labour in their own specialty as a stepping stone to developing their own businesses. And a few work as estimators with private contractors or are hired as inspectors by various levels of government.

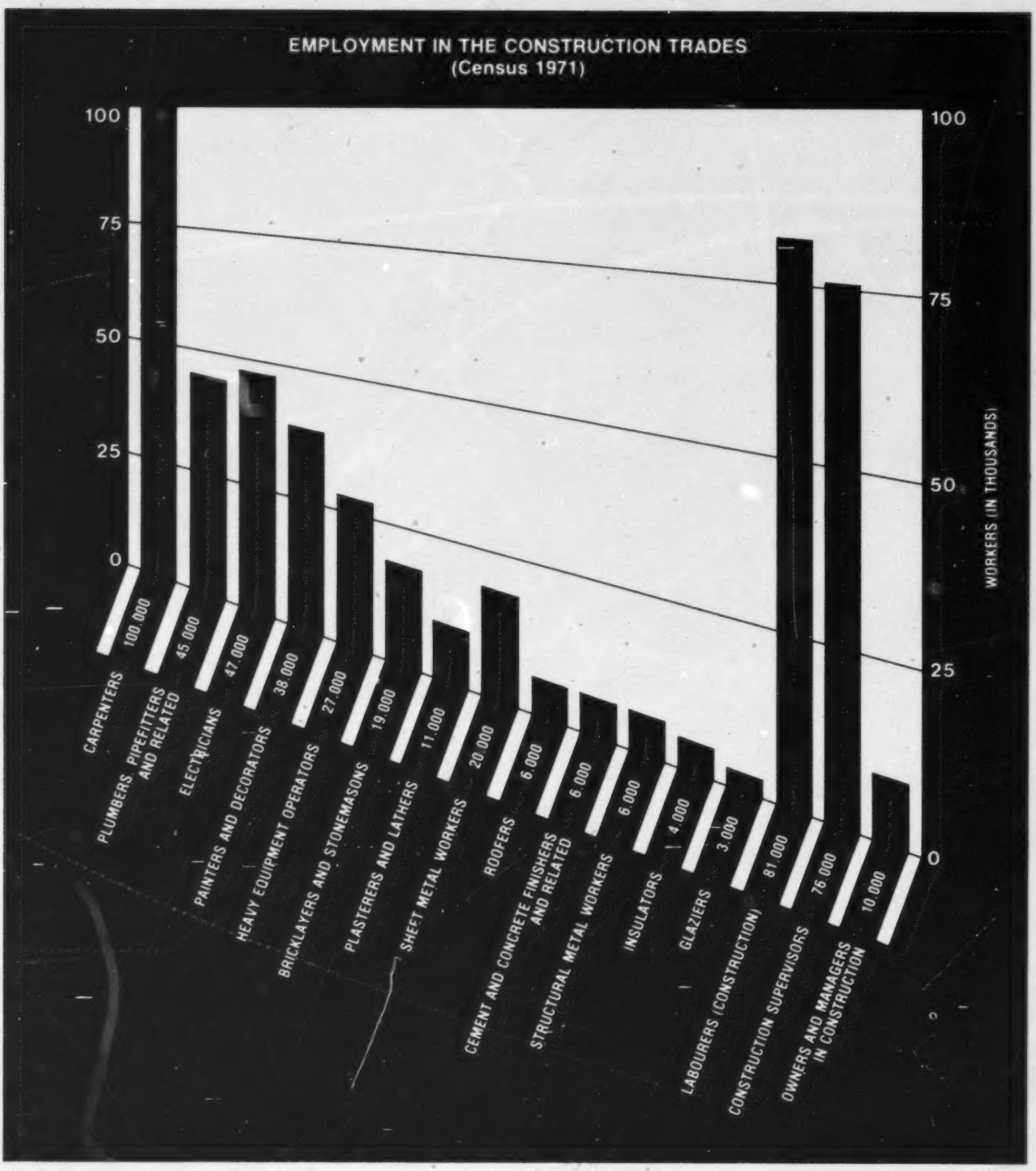
Employment Outlook

A career in one of the construction trades offers favourable opportunities to those who are willing to spend several years in learning a skilled occupation. Subject to local or periodic changes, one worker in 15 is involved in this type of work. Job opportunities occur in all parts of the country, in small communities as well as large cities. In 1971, there were more than 400,000 skilled craft workers employed in the construction trades as well as 80,000 construction labourers and helpers. In October 1974, the number of workers had increased to 692,000.

The construction trades varied greatly in size, from approximately 100,000 workers in carpentry (72 per cent being in the construction industry) compared with a total of some 6,000 concrete and cement finishers. Some construction workers become supervisors for contractors in engineering construction or in building construction; others supervise maintenance activities in industrial or institutional organizations. As indicated on the chart, there were approximately 76,000 supervisory workers in the construction trades in 1971. In addition, nearly 10,000 owners and managers of construction activities had started their own business.

Continued technological developments in construction methods, tools, and materials will result in savings in material costs and raise the hourly output of each construction worker. The introduction of the tower cranes for high-rise building construction, for example, greatly simplifies the pouring of concrete and handling of materials. New products such as plastic piping costs less to buy and reduces the time needed by the plumber for installation. In other instances, technological changes have altered the nature of much of the work, as well as the working conditions involved. Factory prefabrication now ranges from the construc-

PREPARATION AND TRAINING



tion of complete buildings, or major sections of buildings, to door units. This trend toward ready-made building units has the tendency to shift some trade skills into a shop or factory.

Present information shows that during the past several years there have been many job-vacancies in construction compared to other occupations in the work force. There have been actual shortages for workers in some trades, although these were often local and temporary in nature. Preliminary forecasts show that employment in the construction field is expected to grow at a rate near the national average for all occupations to 1980. However, if many energy-related construction projects now anticipated are undertaken, the outlook for construction trades could improve to a growth rate higher than average for the last half of the 1970's.

SEEKING EMPLOYMENT

Before seeking employment, students should discuss their future plans with school guidance counsellors. They can supply much more detailed information than can be included in this chapter, especially on such subjects as the educational and related admission requirements to enter an apprenticeship program. They will also supply details of trade and vocational schools or other pre-employment training courses which may be available in a particular area. This is a continuing service, and useful information can be obtained from the school guidance counsellors, Canada Manpower counsellors, or placement officers, who are located in post-secondary school institutions.

Young people seeking their first jobs or older workers wishing to change occupations can register with the local Canada Manpower Centre. Here they will be given assistance in finding suitable employment or will be directed to apprenticeships, or other training program. In addition to contacting the Canada Manpower Centre, applicants wishing to obtain a construction apprenticeship can pursue one of the following methods: consult the provincial Director of Apprenticeship; locate contractors who are willing to hire them as apprentices; contact a local union and request to have their names placed on the apprentice's training list; present their names to a Joint Apprenticeship Committee which indentures apprentices and is responsible for their employment and training; or check want ads in daily and weekly newspapers. Job seekers can also apply directly to likely employers without reference to a particular vacancy, and employment leads can be obtained from friends and relations already working in the industry.

RELATED PUBLICATIONS

More detailed information about the occupations discussed in this chapter is available at your local CMC. A companion series entitled Careers Provinces will be available and gives the current occupational information in detail. This is prepared for each province and occupation. The standard reference publication, Canadian Classification and Dictionary of Occupations, Volume 1*, provide a systematic structure for over 6,700 occupations found in Canada. The occupations mentioned in *CAREERS IN CONSTRUCTION* are listed below.

Architect
Civil Engineer
Soil Engineer
Land Surveyor
Estimator
Construction Superintendent
Clerk-of-Works
Construction Engineer
Bulldozer Operator
Crane Operator
Shovel Operator
Power Shovel Operator
Blade-Grader Operator
Heavy-Equipment Operator
Pneumatic Drill Operator
Driller
Hoist Operator
(Shotfirer) Blaster
Miner
Pump Operator
Stationery Engineer
Air Compressor Operator
Diver
Concrete Worker
Asphalt Layer
Asphalt Raker
Asphalt Tamper
Concrete-Paving-Machine Operator
Asphalt-Paving-Machine Operator
Pile-Driver
Form Setter
Reinforcing Iron Worker
Concrete Batcher & Mixer
Concrete Mixer
Concrete-Gun Operator
Vibrator Operator
Concrete Finisher
Craneman
Structural-Steel Worker
Welder
Riveter
Carpenter
Bricklayer and Stonemason
Sheet-Metal Worker
Plasterer
Caulker
Glazier and Metal Mechanic
Roofer
Electrician
Plumber
Air Conditioning and Refrigeration Mechanic
Pipe Fitter
Furnace Installer
Insulator
Lather
Tile Setter
Floor Layer
Glazier
Painter
Ornamental Iron Worker
Instrument Man
Notekeeper
Rodman
Surveyor Helper
Quantity Surveyor
Architectural Draftsman
Patternmaker
Cabinet Maker
Rigger
Steam Fitter
Gas Fitter
Sprinkler Fitter
Stucco Mason
Stucco Plasterer
Terrazzo Worker
Marble Setter
Cement Finisher
Curb Builder
Joint Setter
Float Finisher
Tamping Machine Operator
Vibrator Operator

Other information may be obtained from the occupational analysis series. The following are some of the titles:

Carpenter
Bricklayer
Plumber
Sheet-metal worker
Electrician

These publications are available at local C.M.C.

*Available from Information Canada bookstores; Cat. No: MP 53-171/1